

Compromised Water Quality in Colonias of Nueces County, TX: A Vicious Cycle

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Abstract.

Colonias are self-built neighborhoods of mostly low-income families that lack basic infrastructure. While some funding from the state government has built roads and provided electricity, water and sewage systems are still lacking for many of the estimated 400,000 *colonias*' residents in Texas. Of those that do have tap water, the supply is either inadequate or of questionable quality. Some *colonias* residents have access only to off-the-grid water supplies, and residents collect their water from community wells, or, if fortunate, from a personal well. Many of these wells are self-built and therefore shallow. In Nueces County, the groundwater in several *colonias* has been reported to contain arsenic, while poor sanitation practices (i.e., self-built septic systems) and heavy rainfall events in the region compromise the microbial quality of the groundwater. The naturally occurring arsenic in the aquifer and microbial contaminants from flooding events mean that the only available drinking water source in these *colonias* is contaminated throughout the year. In this research, datasets on water quality in nine *colonias* in Nueces County were collected both in wet (after a major rain/flooding event) and dry (no significant rainfall for four weeks) periods. The water quality analyses included traditional microbial quality assessment (total coliforms, *Escherichia coli*, and heterotrophs), pH, hardness, total dissolved solids, and a suite of metals that are relevant to human health (e.g., arsenic and lead). Microbial community analyses also were completed on select samples to assess the shifts in microbial ecology between wet and dry periods. Results reveal that water quality varies based on environmental conditions and presents a serious risk to human health. Water sampled during the wet period had extensive microbial contamination with elevated heterotrophs and total coliforms, and *E. coli* was identified in some samples. In the dry period, water from a number of *colonias* exhibited elevated levels of arsenic (above United States Environmental Protection Agency's Maximum Contaminant Level of 10 µg/L). This study is one of the first to systematically investigate water quality in Texas *colonias*, and the results highlight how water quality in these communities is compromised year-round, going between microbial contamination in wet events and arsenic contamination in dry events.

Key Learning Objectives.

Results from this study highlight the presence of severe water quality issues in Nueces County, TX, *colonias*. Water sampled during the wet period is contaminated with microorganisms, while water sampled during the dry period has elevated levels of arsenic.

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Water Quality, Rural Water Supply, WaSH